Fermilab

Particle Physics Division
Mechanical Department Engineering Note

Number: MD-ENG-326 Date: 30 March 2011

Project Internal Reference:

Project: NOvA Ash River Block Pivoter; FESHM 5031.1 Engineering note for power cylinders hydraulic piping

Title: NOvA Ash River Block Pivoter pivot cylinders hydraulic piping FESHM 5031.1

Author(s): Mike Zuckerbrot

Reviewer(s):

Key Words: Pivoter, Ash River, piping, FESHM 5031.1

Applicable Codes:

Abstract Summary: This note addresses the Fermilab furnished hydraulic piping used for the pivot cylinders in the NOvA block pivoter at Ash River, provided by Phelps Industries. Calculations will be done demonstrating the chosen materials are suitable for the design pressure. The system uses both 2'' and 2 ½'' nominal diameter pipe, and will conform to FESHM 5031.1.

FESHM 5031.1 PIPING ENGINEERING NOTE FORM

Prepared by: Mike Zuckerbrot Preparation Date: 3-30-2011

Piping System Title: NOvA Ash River Pivoter Cylinder Hydraulics

Lab Location: Ash River, Min. Lab Location code:

Purpose of system / System description: Hydraulic piping

Piping System ID Number: N/A

Appropriate governing piping code: ASME A17.1 Safety Code for Elevators and Escalators

Fluid Service Category (if B31.3): Category-D / Normal / Category-M / High Pressure (circle one)

Fluid Contents: Mobile DTE 24 Hydraulic Fluid

Design Pressure: 2000 psig Design Temperature: 100 F

Piping Materials: Carbon steel

Drawing Numbers (PID's, weldments, etc.): 3929.200-ME-489022

Designer/Manufacturer: Fermilab/See vendor contact information

Test Pressure: 450 psig Test Fluid: Oil Test Date: Tbd

Statement of Compliance

Is this piping system considered exceptional? Yes ____ No__x__
If "Yes", follow the requirements for an Extended Engineering Note for Exceptional Piping Systems.

Reviewed by: _____
(Print Name)
Signature: _____Date: _____

D/S Head's Signature: _____Date: _____

The following signatures are required for exceptional piping systems:

ES&H Director's Signature: _____Date: _____

Director's Signature or Designee: _____Date: _____

Pipe Characteristics

Size: 2'' and 2 ½'' n.d. Length: About 536''; Volume: Less than 10 gallons

Relief Valve Information

Type: Manufacturer:

Set Pressure: 105 bar (1522 psig) Relief Capacity: 450 L/min

Relief Design Code: none identified. Relief Capacity exceeds hydraulic pump capacity.

Is the system designed to meet the identified governing code? (Yes)/ No

System Documentation

Process and Instrumentation diagram appended? (Yes)/ No

Process and Instrumentation component list appended? (Yes)/ No

Is an operating procedure necessary for safe operation? Yes /(No)
If 'yes', procedure must be appended.

Fabrication Quality Assurance

List vendor(s) for assemblies welded/brazed off site: none

List welder(s) for assemblies welded/brazed in-house: Bill Gatfield

Are welder qualification records available for in-house welded/brazed assemblies? (Yes)/No
If yes, append documents or make available to reviewer.

Are all quality verification records required by the identified code available? (Yes) / No
(e.g. examiner's certification, inspector's certification, test records, etc.)
If yes, append documents or make available to reviewer.

Discussion:

Table 1 in FESHM 5031.1 does not list a piping service or application that matches this system. This system is a hydraulic system, but not intended to lift and elevator or hoist. However, this system is more like a hydraulic elevator than any other system described in FESHM 5031.1.

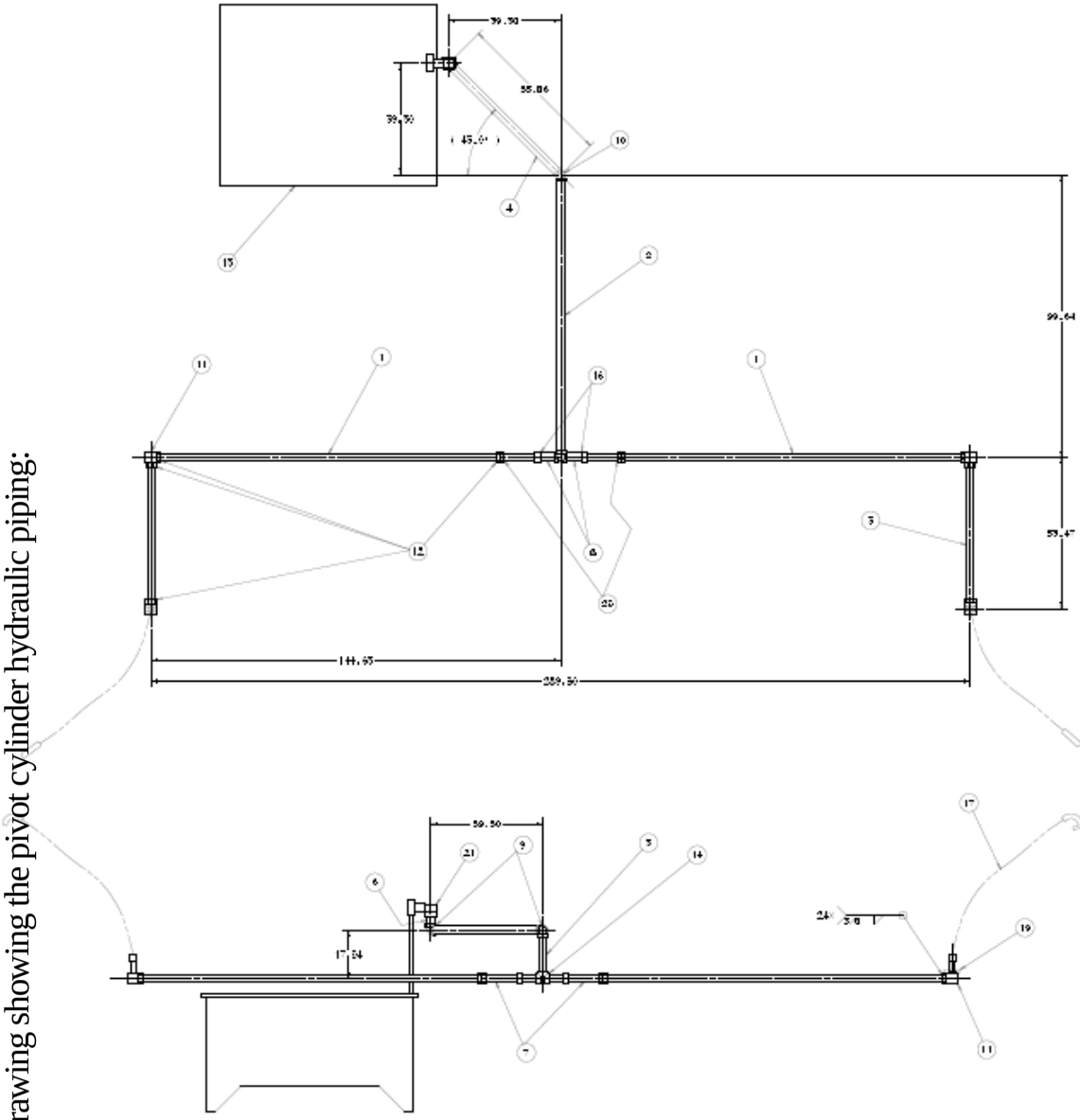
Searching for hydraulic piping standards from ASME or SAE (Society of Automotive Engineers) yields no standards or specifications specific to piping. ASME B31 series codes do not fully apply to the piping used for hydraulic fluid system. For example, ASME B31 codes use ANSI B16.5 flanges, not code 61 and code 62 flanges used with hydraulic fluid power systems which conform to SAE J518 or ISO 6162.

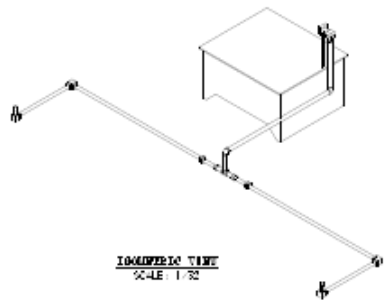
So, the decision was to apply the ASME A17.1 Safety Code for Elevator and Escalators to this system as the governing code.

ANSI ALI ALCTV- 2006, Standard for Automotive Lifts-Safety Requirements for Construction, Testing, and Validation will also be considered.

REV	DESCRIPTION	BY	DATE
A	ADDED ITEMS #19, 20 & 21	SJ ENGLEBRECHT	11-SEP-2011

Drawing showing the pivot cylinder hydraulic piping:





ISOMETRIC VIEW
SCALE: 1/32

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
21	FG200C6140PU	D-HEX II-HIFOLDS ø2 1-2 SOCKET WELD PIPE FLANGE CODED	1
20	FG30L4F150PU	D-HEX II-HIFOLDS ø2 SOCKET WELD PIPE FLANGE CODED	2
19	FF393-32	FLANGE FIT 01 CODED E-TDH -EP00012P	2
18	FF393-04	FLANGE FIT 01 1-2 CODE 61 E-TDH -EP00012P	2
17	[illegible]	HYDRAULIC HOSE #551 01 1-2 ID X 141 LG W/ FLANGE FIT E-TDH -EP00012P	2
16	COIL	PIPE FRANGER SOCKET WELD CL-SS 9000 ø2 1-2 TO ø2 SEE NOTE 2	2
15	A-90-600-PU	CYLINDER P/P UNIT 3-90-600-PU PHELPS INDUSTRIES INC ACM 3143	1
14	COIL	STAND-PD TEE SOCKET WELD ø2 1-2 STEEL CL-SS 9000 SEE NOTE 2	1
12	FG30C6150PU	D-HEX II-HIFOLDS ø2 SOCKET WELD PIPE FLANGE CODE 61	8
11	FG300CF150F	D-HEX II-HIFOLDS ø2 ELBOW JUNCTION BLOCK CODE 61	4
10	COIL	STEEL SOCKET WELD 45° ELBOW ø2 1-2 CL-SS 9000 SEE NOTE 2	1
9	COIL	STEEL SOCKET WELD 90° FEMALE ELBOW ø2 1-2 CL-SS 6000 SEE NOTE 2	2
8	COIL	PIPE ø2 1-2 SCH 160 X 8 LG	2
7	COIL	PIPE ø2 SCH 160 X 12 LG	2
6	COIL	PIPE ø2 1-2 SCH 160 X 5 LG	1
5	COIL	PIPE ø2 1-2 SCH 160 X 13.93 LG	1
4	COIL	PIPE ø2 1-2 SCH 160 X 58.25 LG	1
3	COIL	PIPE ø2 SCH 160 X 48 LG	2
2	COIL	PIPE ø2 1-2 SCH 160 X 96 LG	1
1	COIL	PIPE ø2 SCH 160 X 120 LG	2

PARTS LIST

DRAWN	SJ ENGLEBRECHT	15-FEB-2011
CHECKED	J. ALLEN	20-MAR-2011
APPROVED	B. PUGH -	20-MAR-2011

MATERIAL: SEE PARTS LIST -ABOVE

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

NOVA-EQUIPMENT HANDLING
AP REAR PLATFORM ASSY.
AP CYLINDER PIPING ASSY 2

SCALE: 1/8 | DRAWING NUMBER: 3929.200-ME-489002 | SHEET 1 OF 1 | REV A

NOTE:

1. ALL PIPES ARE ASTM A106 SEAMLESS SCHEDULE 160.
2. ALL FORGED FITTINGS ARE CLASS 6000 ASME B16.11 CARBON STEEL FORGED.
3. ALL WELDING PER ASME B31.3 NORMAL FLUID SERVICE AND SUBJECT TO RADIOGRAPHIC INSPECTION
4. GTAW ROOT AND FILL PASSES W/ ER 70S FILLER.

Welder qualifications

Fermilab *Fermi National Accelerator Laboratory*

Technical Division-Machine Shop

WELDER PERFORMANCE QUALIFICATION TEST REPORT

Welder's Name: William Garfield #04600 ASME No. W-12

Welding Process(es) 1st GTAW Manual Type ______ 2nd ______ Type ______

In accordance with WPS No. FERMI 08-4

Joint: Fillet ______ ☐ ~~Production Weld~~ X Test Coupon

Groove Double Welded: ☐ Yes X No

Single Welded: ☐ Metal Fused ☐ Metal Non-Fused ☐ Non-Metal X Open Root ☐ Consumable Insert

☐ With Solid Backing X Without Solid Backing

Base Metals: Spec. SA 106 to SA 106 (ASME IX) P. No. 1 to P. No. 1

☐ Plate X Pipe ☐ Tube

Actual Thickness ______ Nominal Diameter 4NPS Actual Diameter 4.5" OD ______

Qualified Range ______ Wt/Sch 80 Qual. Thick Range 0-0.674 Wall ______

Actual Thickness 0.337 Qual. Dia Range 2-7/8 min Qual. Thick Range ______

Qual. Dia Range ______

1st Process / 2nd Process

Fillers: Spec. SFA 5.18 Class ER70S-2 Spec. ______ Class ______

Dia.(s) 3/32 Dia.(s) ______

F. No. 6 F. No. ______

Deposit Thickness 0.337 Range Qual. 0-0.674 Deposit Thickness ______ Range Qual. ______

Position(s) (Fil. and.): 6G If Vertical Up X Down ______

Gas (Type and Composition): Fuel ______ Shielding Ar 99.9% Root Side Backing Ar 99.9% ______.

Electrical Type Current ☐ AC ☐ DC – Reverse X DC – Straight

Transfer GMAW ☐ Spray ☐ Globular ☐ Pulse ☐ Short Circuit

FOR INFORMATION ONLY		MACHINE WELDING
Filler Metal Trade Name:		Controls: ☐ Visual ☐ Remote Visual
S.A.W. Flux Trade Name:		Arc Voltage Control ☐ Auto ☐ Other ______
Shielding Gas Trade Name:		Joint Tracking ☐ Yes ☐ No

VISUAL INSPECTION

Appearance: Satisfactory Undercut ______ Piping porosity ______

GUIDED BEND TEST

TYPE AND FIGURE	RESULTS	TYPE AND FIGURE	RESULTS	TYPE AND FIGURE	RESULTS

Test Conducted by ______ Lab Test No. ______

Date ______

RADIOGRAPHIC TEST

Results Satisfactory For ASME IX-2007 and AWS D1.1-06

Radiographer Alloyweld Inspection Co., Inc Examiner Jennifer Anaya, Level II Test No. 175214 Date 4/29/2009

FILLET WELD TEST RESULTS

Fracture Test ______

Location, Nature, and Size of Crack or Tear in Specimen

Length of Weld ______ inch. Length of Defect ______ inch. ______ % of Defect

Macro Test: Fusion ______

Appearance: Fillet size ______ inch × ______ inch ☐ Convex ☐ Concave

Test Conducted by ______ Lab Test No. ______

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME IX-2007 and AWS D1.1-06 *Fermi National Accelerator Laboratory* ______.

By ______ Date 5/1/2009

In process weld inspection form

In-Process Weld Inspection Form

(As per In-Process Weld Inspection Guidelines)

Date: 5-02 to 5-23-2011 Project: NOVA Equipment Handling AR Rear Platform AR Drive Tank unit Assy. Print number 3929.200-ME-486977..

Pipe Section: SEE PRINTS Below Weld Number: 7

Weld Location: MAB

Welder: Mike Cooper Inspector: Dave Erickson

Before Welding:

Type of weld: (butt) _____ (other) Socket

(1) Pipe #1 Size, Schedule and Material: pipe 3/4 sch 160

(2) Pipe #2 Size, Schedule and Material: pipe 2½ sch 160

(1) Joint Preparation and Cleanliness

Joint Preparation and Cleanliness acceptable? ✓

(2) Welding Machine

(a) Remote foot pedal? ✓

(b) DC straight machine? ✓

(3) Joint Fit-up, and Internal Alignment

(a) Internal alignment acceptable? ✓

(b) Joint clearance acceptable? ✓

(c) End perparation acceptable? ✓

(4) Filler Rod

(a) AWS A5.9 stainless steel filler rod? N/A

(b) Filler rod: Class ER70S-2 Diameter 3/32

(5) Purge Gas

(a) type of purge gas: Argonne

(b) time length of purge: N/A purge flow rate: N/A

(c) Use of "Check-Weld" meter to measure Oxygen rate for purge acceptance? N/A

(d) What was "Check-Weld" meter reading at time of weld? N/A

(6) Inspection After Root Pass

(a) No visible cracks. ✓

(b) No suck holes, which are small holes in middle of weld. ✓

(c) No porosity or obvious imperfections: ✓

(d) Filler material fused along edges of weld. ✓

(7) Repeat inspection after every pass: ✓

(8) Final Inspection: Dave Erickson

(9) Cold Shock weld before leak check? N/A

(10) Leak Check Rate/pass? N/A

Prints: 3929.200-ME-486977
3929.200-ME-489002

Calculations:

Pipe Material	A106 Grade B Seamless
Maximum Operating temperature	100 F
Diameters	2'', 2 ½''
Schedule	160
Maximum Allowable Stress per ASME B31.1-2004 Appendix A, Table A-1	15,000 psi
Maximum Allowable Stress per ASME B31.3-2008 Appendix A, Table A-1	20,000 psi
Max Allowable Stress per ANSI ALI ALCTV-2006 section 9.1.1.2.1	Burst pressure > 300% design pressure
Outside Diameter, D	See table below
Wall thickness, t	See table below
Maximum Working Pressure, P	See table below
Corrosion allowance, C	0.0 (this piping is used indoors with non-corrosive oil on the inside and is not threaded nor has any wall thickness reductions)
Joint Efficiency, e	1.0 for seamless pipe
Percent Elongation for A106Gr B, E	30
Min. Factor of Safety per ASME A17.1 Rule 1302.5a	F = (5.04/(30-2.8)) + 2.7 = 2.89
Minimum Allowable F governs	F=3.0
Yield Point, Y.P. for A106Grade B per ASME B31.1 Table A-1	35 ksi
Allowable Stress, S, as calculated by ASME A17.1 Rule 1302.5b	S = (Y.P./ F) = 35 ksi / 3 = 11.67 ksi
Minimum tensile stress, Sten, per ASME B31.1 Table A-1	60 ksi
Max internal pressure per ASME A17.1 Rule 1302.4	P = 2*e*S*(t-C)/D
Burst pressure, per Barlow's formula	P = 2(Sten)t/D

Result is that the ASME A17.1 Safety Code for Elevator and Escalators is more stringent for the allowable stress for A106 grade B pipe than is ASME B31.1 or ASME B31.3. ASME A17.1 and ALI ALCTV-2006 will be used for analysis below.

Using the allowable stress values from ASME A17.1, calculate the allowable internal pressure for each size of schedule 80 pipe used where the outside diameter and wall thickness come from the ANSI pipe specification and the allowable internal pressure is calculated using the formula from ASME A17.1 Rule 1302.4 as written above.

Nominal pipe diameter	Outside diameter (inches)	Sch. 160 wall thickness (inches)	Max allowable internal pressure per ASME A17.1 rule 1302.4 (psi)
2''	2.375	0.343	3,371
2 ½''	2.875	0.375	3,044

It is shown that the max allowable internal pressure is greater than design pressure (2,000 psig).

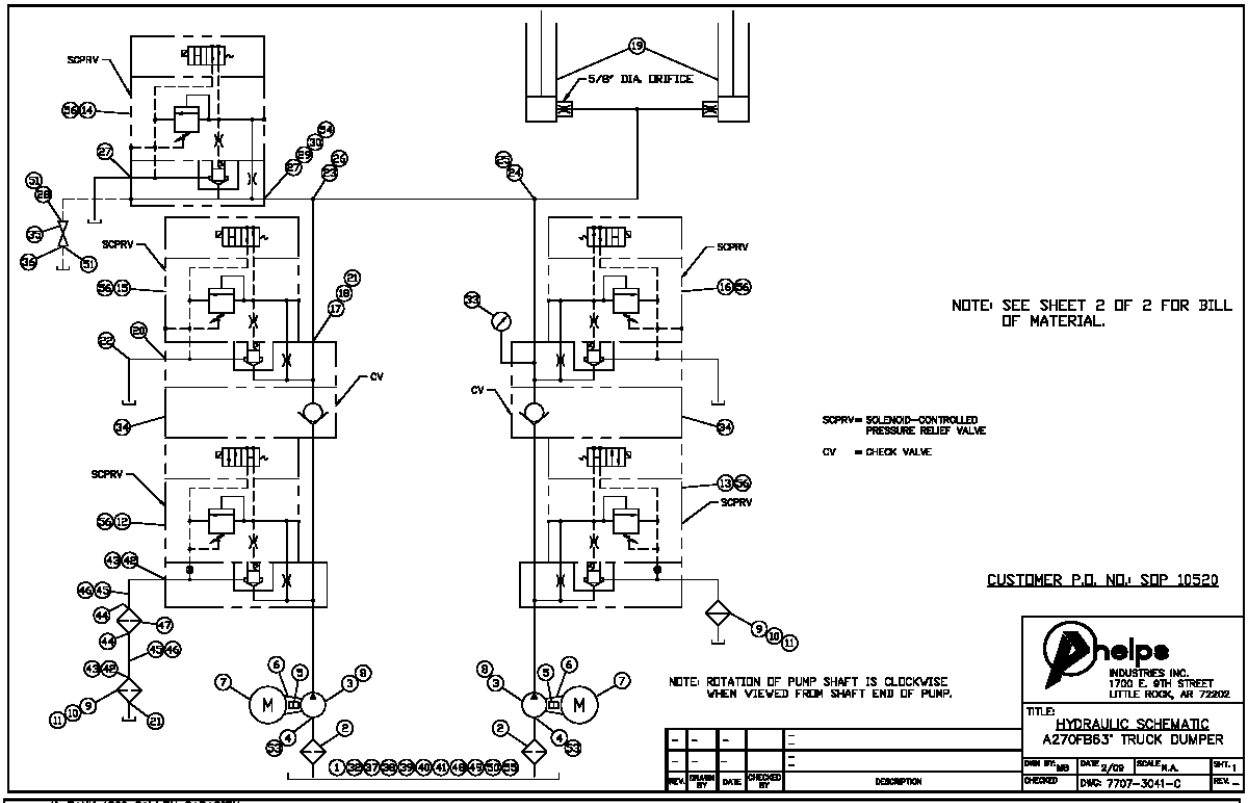
Though ASME A17.1 will be considered the governing code on the system, the ANSI ALI ALCTV-2006, Standard for Automotive Lifts-Safety Requirements for Construction, Testing, and Validation will also be considered. ANSI ALI ALCTV-2006 section 9.1.1.2.1 specifies that rigid pipe must have a burst pressure of at least 300% the pressure required at maximum load capacity (the design pressure). The ANSI ALI ALCTV standard does not provide instruction for calculating burst pressure; therefore the burst pressure will be calculated with the commonly used Barlow formula which is a reduction of ASME A17.1 Rule 1302.4 substituting ultimate tensile stress for yield stress and setting the safety factor F = 1.

- Burst pressure must be greater than 300% design pressure, greater than 6,000 psig.

Nominal pipe diameter	Outside diameter (inches)	Sch. 160 wall thickness (inches)	Burst pressure per Barlow's formula above (psi)
2''	2.375	0.343	17,331
2 ½''	2.875	0.375	15,652

It is shown burst pressure is much greater than 300% design pressure (6,000 psi)

Cylinder detail from Phelps Industries



1)	TANK-1200 GALLON CAPACITY	
2)	SUCTION STRAINERS-HYDRO-CRAFT HAFS-100RV3 (2 REQ'D.)	STR1RV301
3)	PUMP-VICKERS 45V-60-A-1-C-22R (2 REQ'D.)	PUM145V14
4)	90° SOCKET WELD FLANGE-ANCHOR #W176-48-48-U, 3" DIA. (2 REQ'D.)	FLG130065
5)	COUPLINGS-FALK 040R10 WRAPFLEX, DRIVEN HUB-FALK R10, 1 1/4" DIA. BORE X 5/16" K.W. (2 REQ'D.)	COP130R11
	DRIVER HUB-FALK R10, 2 3/8" DIA. BORE WITH 5/8" K.W. (2 REQ'D.)	COP130R14
	NYLON COVER FOR FALK 40R10 (2 REQ'D.)	COP130R13
6)	FIBERGLASS COUPLING GUARDS (2 REQ'D.)	GAR148701
7)	MOTORS-U.S. MOTORS MODEL NO.: ES7C, 60 HP., 364 T-FRAME, 1750 RPM, 240/480 VOLT, 3 PH, 60 HZ., 1.15 S.F., T.E.F.C., HIGH EFFICIENCY, SEVERE DUTY (2 REQ'D.)	MOT360X21
8)	FOOT BRACKET KITS FOR VICKERS PUMPS-VICKERS F3-C-10 (2 REQ'D.)	PUM1FBC04
9)	RETURNLINE FILTER HEAD-VICKERS HS221FE3NB250 (2 REQ'D.)	FIL2SS016
10)	RETURNLINE FILTER ELEMENTS-VICKERS V02119260 (4 REQ'D.)	ELE1R2032
11)	RETURNLINE FILTER INDICATOR GAUGE-ZINGA CI-20 (2 REQ'D.)	FIL112027
12)	SOLENOID CONTROLLED RELIEF VALVE-DENISON R5V12-333-12-09-W01-A1 WITH 1/2" CONDUIT CONNECTOR, 1 1/2" (N.O.)	VAL120973
13)	SOLENOID CONTROLLED RELIEF VALVE-DENISON R5V12-333-12-09-W01-A1 WITH 1/2" CONDUIT CONNECTOR, 1 1/2" (N.O.)	VAL120973
14)	SOLENOID CONTROLLED RELIEF VALVE-DENISON R5V06-533-12-11-W01-A1 WITH 1/2" CONDUIT CONNECTOR, 3/4" (N.C.)	VAL121177
15)	SOLENOID CONTROLLED RELIEF VALVE-DENISON R5V12-333-12-11-W01-A1 WITH 1/2" CONDUIT CONNECTOR, 1 1/2" (N.C.)	VAL121174
16)	SOLENOID CONTROLLED RELIEF VALVE-DENISON R5V12-333-12-11-W01-A1 WITH 1/2" CONDUIT CONNECTOR, 1 1/2" (N.C.)	VAL121174
17)	A199-87 THREADED ROD, 1/2"-13 NC X 12 1/2" LG., CLASS 2A FIT (8 REQ'D.)	RTH150087
18)	1/2"-13 NC LOCKNUTS WITH NYLON INSERT, ZINC PLATED (8 REQ'D.)	NUT550006
19)	DECK CYLINDERS-PHELPS MODEL 7605-500-F-C (2 REQ'D.)	
20)	WELD TYPE "O" RING FLANGES-ANCHOR W4-24-24-U, 1 1/2" DIA. (4 REQ'D.)	FLG115012
21)	90° SOCKET WELD TYPE "O" RING FLANGE ELBOWS-ANCHOR W176-24-24-U, 1 1/2" DIA. (4 REQ'D.)	FLG115022
22)	1 1/2" X 90° BUTT WELD ELBOW, SCHEDULE 40 (2 REQ'D.)	ELB315003
23)	1 1/2" SOCKET WELD TEE, F.S., BLACK, 3000# (1 REQ'D.)	TEE215004
24)	2 1/2" X 1 1/2" SOCKET WELD BUSHINGS, F.S., BLACK, 3000# (2 REQ'D.)	INS125009
25)	2 1/2" SOCKET WELD TEE, F.S., BLACK, 3000# (1 REQ'D.)	TEE225008
26)	1 1/2" X 3/4" SOCKET WELD BUSHING, F.S., BLACK, 3000# (1 REQ'D.)	INS115013
27)	90° SOCKET WELD ELBOWS-ANCHOR W176-12-12-U, 3/4" DIA. (2 REQ'D.)	FLG175045
28)	CONNECTOR PLATE - ANCHOR #12CP, 3/4" (1 REQ'D.)	FLG912C05
29)	3/8"-16 NC X 5" LG. HEX BOLTS, GRADE 8, ZINC PLATED (4 REQ'D.)	BOL337519
30)	3/8" LOCKWASHERS, ZINC PLATED (4 REQ'D.)	WAS437503
31)	DELETED	
32)	PIPE CLAMP-BEHRINGER H72875, 2 1/2" (1 REQ'D.)	CLA225040
33)	PRESSURE GUAGE-WIKA 213.53S2.5LM3000 (1 REQ'D.)	GAG121305
34)	CHECKVALVES-DENISON C5V12-310-B1, 1 1/2" (2 REQ'D.)	VALBC5V41
35)	BALL VALVE-HYCON KHB20-F3-1-1-1-4, 3/4" (1 REQ'D.)	VALSKHB20
36)	WELD TYPE FLANGE-ANCHOR #W61-12-12-U, 3/4" DIA. (1 REQ'D.)	FLG175021
37)	MAGNET ROD-HYDRO CRAFT HC-MT-20 (1 REQ'D.)	MAG112001
38)	AIR FILTER-VESCOR ASE31P250 (1 REQ'D.)	FIL131P26
39)	CLEAN OUT DOOR-HYDRO CRAFT HC-EC-10 (2 REQ'D.)	DORIC1801
40)	OIL LEVEL SIGHT GUAGE-HYCON FSA-127-11/12 (1 REQ'D.)	GAG2FSA01
41)	DRAIN VALVE-APPOLO 70-101-01, 1/4" DIA. (1 REQ'D.)	VAL501003
42)	SPLIT FLANGES-ANCHOR 24-SF-D, 1 1/2" DIA. (2 REQ'D.)	FLG315001
43)	90° SPLIT FLANGE/37° J.I.C. FLARE ADAPTER-PARKER 1973-24-24 (2 REQ'D.)	ADP69T307
44)	STRAIGHT MALE JIC/MALE O-RING BOSS ADAPTER-PARKER 0503-20-24 (2 REQ'D.)	FTP315016
45)	HYDRAULIC HOSE-PARKER 301-24, 1 1/2" I.D. X 5'-0" LG. (CUT TO LENGTH) (2 REQ'D.)	HOSP15019
46)	CRIMP-ON HOSE ENDS-PARKER 10643-24-24, FEMALE JIC 37° STRAIGHT SWIVEL (4 REQ'D.)	END115080
47)	AIR TO OIL COOLER-THERMAL TRANSFER ADR-40-1-S-60-F3 WITH 1/2 HP., 56 T-FRAME, 1140 RPM, 240/480 VOLT, 3 PH., 60 HZ., T.E.F.C. MOTOR (1 REQ'D.)	HEX140110
48)	TEMPERATURE SWITCH-A.B. 837-A4.1 (2 REQ'D.)	TEM1AJ401
49)	PACKING GLAND ASSEMBLY FOR ITEM #48-A.B. 837-N5 (2 REQ'D.)	TEMINSX02
50)	LOW OIL LEVEL SWITCH-GEMS LS-2650, P/N 30298 (1 REQ'D.)	SWT605001
51)	FOUR BOLT SPLIT FLANGE, CODE 61-ANCHOR 12-SF-D, 3/4" (2 REQ'D.)	FLG375005
52)	DELETED	
53)	3" X 90° BUTT WELD ELBOW, SCHEDULE 40 (2 REQ'D.)	ELB330006
54)	3/8"-16 NC REGULAR FULL HEX NUTS, ZINC PLATED (4 REQ'D.)	NUT237503
55)	OIL HEATER-PROTEC DST-9448 PSX., 9 K.W., 480 VOLT, 3 PH, 60 HZ., 11 AMPS. WITH 50° TO 250° F. THERMOSTAT (1 REQ'D.)	HEA1D5T01
56)	LIGHTED DIN CONNECTORS FOR ITEMS 12 THRU 16-CANFIELD CONNECTORS 5107-1091000 (5 REQ'D.)	CON9CSN52

CUSTOMER P.O. NO.: SOP 10520

Phelps
INDUSTRIES INC.
1700 E. 9TH STREET
LITTLE ROCK, AR 72202

TITLE:
BILL OF MATERIAL
HYDRAULIC SCHEMATIC

DWN BY: MB | DATE: 2/09 | SCALE: N.A. | SHT. 2
CHECKED | DWG: 7707-3041-C | REV. –

SHEET 2 OF 2

A "C" in the item number denotes the part is for the pivot cylinders

PURCHASE REQUISITION

Fermilab

Requisition

Requisition Number (Filled in by System)	Oracle Preparer (Filled in by System)	Date	Request originator:
		5/7/10	Mike Zuckerbrot
Division/Section Approval		Date	NEPA Approval
Business Office Approval		Date	
Directorate Approval		Date	

Requisition Header

Description (of entire requisition)
Hydraulic components for the Ash River block pivoter

Note to Approver

Justification (To Approver)

Requisition Entry Defaults

Requester	Deliver-To-Location	Buyer Note (use attachments) (i.e., Previous PO)
Dave Pushka	Lab F	

Suggested Vendor	Suggested Vendor Site	Suggested Vendor Contact
Valley Hydraulic	610 Stevenson Road, South Elgin Illinois 60177	Tom Petersen

Reference #	Need-By-Date	Project/Task/Expenditure Type and Expenditure Organization
	06-14-2010	425.2.8.1.4 NOvA Ash River Pivoter

Note to Receiver

Requisition Lines

Line #	Line Type	PO Line Category	Description (Start with a Noun) (240 Characters Maximum, Enter Additional Description in Cell Below Line Item)	Quantity, Unit of Measure and Price			
1	GR	Hose Assy.	Hydraulic hose assembly, 3/4'' i.d. Eaton Aeroquip; FC254-FH-FHA-12-16-12X81" w/ flange kit UN Number Hazard Class	Quantity	4	Project	
				Unit of Measure	each	Task	
				Price per Unit	$203.80	Exp. Type	
				Extended Price	$815.20	Exp. Org.	
2	GR	Hose Assy.	Hydraulic hose assembly, 3/4'' i.d. Eaton Aeroquip; FC254-FH-FHB-12-16-12X96" w/ flange kit UN Number Hazard Class	Quantity	4	Project	
				Unit of Measure	each	Task	
				Price per Unit	$202.71	Exp. Type	
				Extended Price	$810.84	Exp. Org.	
3C	GR	Hose Assy.	Hydraulic hose assembly, 1-1/2'' i.d. Eaton Aeroquip; FC254-FL-FLB-32-24-24X145" w/ flange kit UN Number Hazard Class	Quantity	2	Project	
				Unit of Measure	each	Task	
				Price per Unit	$643.55	Exp. Type	
				Extended Price	$1287.10	Exp. Org.	

4			Flange kit, Eaton Aeroquip 1'' code 62 flange kit, Part number FF595-	Quantity	8	Project	

	GR	Flange kit	16 UN Number Hazard Class	Unit of Measure	each	Task		
				Price per Unit	$36.85	Exp. Type		
				Extended Price	$294.80	Exp. Org.		
5	GR	Flange kit	Flange kit, Eaton Aeroquip ¾'' code 62 flange kit, Part number FF595-12 UN Number Hazard Class	Quantity	8	Project		
				Unit of Measure	each	Task		
				Price per Unit	$31.08	Exp. Type		
				Extended Price	$248.64	Exp. Org.		
6C	GR	Flange kit	Flange kit, Eaton Aeroquip 1-1/2'' code 61 flange kit, Part number FF593-24 UN Number Hazard Class	Quantity	2	Project		
				Unit of Measure	each	Task		
				Price per Unit	$35.28	Exp. Type		
				Extended Price	$70.56	Exp. Org.		
7C	GR	Flange Kit	Flange kit, Eaton Aeroquip 2'' code 61 flange kit, Part number FF593-32 UN Number Hazard Class	Quantity	2	Project		
				Unit of Measure	Each	Task		
				Price per Unit	$48.32	Exp. Type		
				Extended Price	$96.64	Exp. Org.		

ITEMS TO BE COMPLETED BY THE REQUESTER:

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6. **REQUESTER** — **Name of person expecting delivery of item**
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8. NOTE TO BUYER — Short note (240 characters) to buyer indicating previous P.O. number, and term of service if Line Type is SN, etc., must be placed in Attachments
9. SUGGESTED VENDOR/SITE/CONTACT/TELEPHONE — Your recommendation for selecting a vendor, including name, address, contact, telephone number
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13. **BUILDING MAINTENANCE** — **Circle Yes or No, if yes is circled FIMS number is required**
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21. **PRICE PER UNIT** — **The dollar amount you have authorized the Procurement Department to spend for an item**
22. EXTENDED PRICE — Extended price for each item requested
23. **PROJECT/TASK/EXP. TYPE AND EXP. ORG.** — **Project/Task and Exp.Type where line items are charged and Exp. Org. - organization spending the money, if different from above**

24. SPLIT CODING QUANTITIES
Type and Expenditure Organization

Quantities applied to each Project/Task/Expenditure

Fermilab

PURCHASE REQUISITION

Requisition

Requisition Number (Filled in by System)	Oracle Preparer (Filled in by System)	Date	Request originator:
		5-10-10	Mike Zuckerbrot
Division/Section Approval		Date	NEPA Approval
Business Office Approval		Date	
Directorate Approval		Date	

Requisition Header

Description (of entire requisition)
Hydraulic components for the Ash River block pivoter

Note to Approver

Justification (To Approver)

Requisition Entry Defaults

Requester	Deliver-To-Location	Buyer Note (use attachments) (i.e., Previous PO)
Dave Pushka	(not Mail Station) **Lab F**	

Suggested Vendor	Suggested Vendor Site	Suggested Vendor Contact
Motion Industries	333 Charles Court, West Chicago	James Neske

Reference #	Need-By-Date	Project/Task/Expenditure Type and Expenditure Organization
	6-14-10	425.2.8.1.4 NOvA Ash River Pivoter

Note to Receiver

Requisition Lines

Line #	Line Type	PO Line Category	Description (Start with a Noun) (240 Characters Maximum, Enter Additional Description in Cell Below Line Item)	Quantity, Unit of Measure and Price			
1C	GR	Mech Mech	Pipe Flange, Daman Manifolds 2-1/2'' socket weld pipe flange code 61, FG40CWG140PU UN Number Hazard Class	Quantity	1	Project	
				Unit of Measure	each	Task	
				Price per Unit	$49.79	Exp. Type	
				Extended Price	$49.79	Exp. Org.	
2C	GR	Mech Mech	Pipe Flange, Daman Manifolds 2'' socket weld pipe flange code 61, FG32CWG132PU UN Number Hazard Class	Quantity	8	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$42.92	Exp. Type	
				Extended Price	$343.36	Exp. Org.	
3C	GR	Mech Mech	Elbow junction block, Daman Manifolds 2''code 61 Elbow junction block; FG32CCF132FX UN Number Hazard Class	Quantity	4	Project	
				Unit of Measure	each	Task	
				Price per Unit	$221.23	Exp. Type	
				Extended Price	$884.92	Exp. Org.	

4C	GR	Mech	Pipe Flange, Daman Manifolds 2-1/2'' socket weld pipe flange code 61, FG40CWF140PU UN Number Hazard Class	Quantity	1	Project	
				Unit of Measure	each	Task	
				Price per Unit	$49.79	Exp. Type	
				Extended Price	$49.79	Exp. Org.	
5C	GR	Mech Mech	Pipe Flange, Daman Manifolds 2'' socket weld pipe flange code 61, FG32CWF132PU UN Number Hazard Class	Quantity	2	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$42.92	Exp. Type	
				Extended Price	$85.84	Exp. Org.	
6C	GR	Mech Mech	Dust Cover, Daman Manifolds 2'' zero psi plate; FP32CZ1U UN Number Hazard Class	Quantity	10	Project	
				Unit of Measure	each	Task	
				Price per Unit	$8.41	Exp. Type	
				Extended Price	$84.10	Exp. Org.	
7C	GR	Mech Mech	Dust Cover, Daman Manifolds 2 ½'' zero psi plate; FP40CZ1U UN Number Hazard Class	Quantity	1	Project	
				Unit of Measure	each	Task	
				Price per Unit	$12.54	Exp. Type	
				Extended Price	$12.54	Exp. Org.	
9C	GR	Mech Mech	Blanking Plate, Daman Mainfolds 2'', FG32CKF1X UN Number Hazard Class	Quantity	8	Project	
				Unit of Measure	each	Task	
				Price per Unit	$40.45	Exp. Type	
				Extended Price	$323.60	Exp. Org.	
10 C	GR	Mech Mech	Blanking Plate, Daman Mainfolds 2'', FG32CKG1U UN Number Hazard Class	Quantity	2	Project	
				Unit of Measure	each	Task	
				Price per Unit	$39.02	Exp. Type	
				Extended Price	$78.04	Exp. Org.	
11 C	GR	Mech Mech	Blanking Plate, Daman Mainfolds 2 ½'', FG40CKF1X UN Number Hazard Class	Quantity	1	Project	
				Unit of Measure	each	Task	
				Price per Unit	$58.99	Exp. Type	
				Extended Price	$58.99	Exp. Org.	
12 C	GR	Mech Mech	Blanking Plate, Daman Mainfolds 2 ½'', FG40CKG1U UN Number Hazard Class	Quantity	1	Project	
				Unit of Measure	each	Task	
				Price per Unit	$49.81	Exp. Type	
				Extended Price	$49.81	Exp. Org.	
13 C	GR	Mech Mech	Test Plate, Daman Manifolds 2'' gauge port spacer; FP32CG1X UN Number Hazard Class	Quantity	2	Project	
				Unit of Measure	each	Task	
				Price per Unit	$47.96	Exp. Type	
				Extended Price	$95.92	Exp. Org.	

Line #	Line Type	PO Line Category	Description (Start with a Noun) (240 Characters Maximum, Enter Additional Description in Cell Below Line Item)	Quantity, Unit of Measure and Price			
14	GR	Mech Mech	Elbow junction block, Daman Manifolds 3/4'' code 62 Elbow junction block; FG12CCF212FX UN Number Hazard Class	Quantity	0	Project	
				Unit of Measure	each	Task	
				Price per Unit	$128.39	Exp. Type	
				Extended Price	0	Exp. Org.	

15	GR	Mech	Pipe Flange, Daman Manifolds 3/4'' socket weld pipe flange code 62, FG12CWG212PU UN Number Hazard Class	Quantity	12	Project	
				Unit of Measure	each	Task	
				Price per Unit	$26.00	Exp. Type	
				Extended Price	$312.00	Exp. Org.	
16	GR	Mech	Pipe Flange, Daman Manifolds 3/4'' socket weld pipe flange code 62, FG12CWF212PX UN Number Hazard Class	Quantity	18	Project	
				Unit of Measure	each	Task	
				Price per Unit	$31.00	Exp. Type	
				Extended Price	$558.00	Exp. Org.	
17	GR	Mech Mech	Dust Cover, Daman Manifolds ¾'' zero psi plate; FP12CZ2U UN Number Hazard Class	Quantity	30	Project	
				Unit of Measure	each	Task	
				Price per Unit	$4.98	Exp. Type	
				Extended Price	$149.40	Exp. Org.	
18	GR	Mech Mech	Test Plate, Daman Manifolds ¾'' gauge port spacer; FP12CG2X UN Number Hazard Class	Quantity	6	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$42.40	Exp. Type	
				Extended Price	$254.40	Exp. Org.	
19	GR	Mech Mech	Blanking Plate, Daman Mainfolds ¾'', FG12CKF2X UN Number Hazard Class	Quantity	12	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$25.74	Exp. Type	
				Extended Price	$308.88	Exp. Org.	
20	GR	Mech Mech	Blanking Plate, Daman Mainfolds ¾'', FG12CKG2X UN Number Hazard Class	Quantity	18	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$23.39	Exp. Type	
				Extended Price	$421.02	Exp. Org.	
21	GR	Mech Mech	Hose plug, Daman Manifolds ¾'' blanking plug, FF12CKF2 UN Number Hazard Class	Quantity	8	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$8.40	Exp. Type	
				Extended Price	$67.20	Exp. Org.	
22	GR	Mech Mech	Hose plug, Daman Manifolds 1'' blanking plug, FF16CKF2 UN Number Hazard Class	Quantity	8	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$8.61	Exp. Type	
				Extended Price	$68.88	Exp. Org.	
23	GR	Mech Mech	Hose plug, Daman Manifolds 1 ½'' blanking plug, FF24CKF1 UN Number Hazard Class	Quantity	2	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$6.89	Exp. Type	
				Extended Price	$13.78	Exp. Org.	
24	GR	Mech Mech	Hose plug, Daman Manifolds 2'' blanking plug, FF32CKF1	Quantity	2	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$8.61	Exp. Type	

			UN Number	Hazard Class	**Extended Price**	$17.22	**Exp. Org.**	

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24. SPLIT CODING QUANTITIES — **Quantities applied to each Project/Task/Expenditure Type and Expenditure Organization**

Fermilab

PURCHASE REQUISITION

Requisition

Requisition Number (Filled in by System)	Oracle Preparer (Filled in by System)	Date	Request originator:
		4-2-11	Mike Zuckerbrot
Division/Section Approval		Date	NEPA Approval
Business Office Approval		Date	
Directorate Approval		Date	

Requisition Header

Description (of entire requisition)
Hydraulic components for the Ash River block pivoter

Note to Approver

Justification (To Approver)

Requisition Entry Defaults

Requester	Deliver-To-Location	Buyer Note (use attachments)
Mike Zuckerbrot	(not Mail Station) **Lab F**	(i.e., Previous PO)

Suggested Vendor	Suggested Vendor Site	Suggested Vendor Contact
Bonney Forge / best source	Locate sales person / distributor	

Reference #	Need-By-Date	Project/Task/Expenditure Type and Expenditure Organization
		425.2.8.1.4 NOvA Ash River Pivoter

Note to Receiver

Requisition Lines

Line #	Line Type	PO Line Category	Description (Start with a Noun) (240 Characters Maximum, Enter Additional Description in Cell Below Line Item)	Quantity, Unit of Measure and Price			
1C	GR	Mech	Class 6000 ASME B16.11 socket weld pipe reducer, 2 ½'' x 2''	Quantity	2	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$500.00	Exp. Type	
			UN Number Hazard Class	Extended Price	$1,000	Exp. Org.	
2C	GR	Mech	Class 6000 ASME B16.11 socket weld tee, 2 ½''	Quantity	1	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$455.79	Exp. Type	
			UN Number Hazard Class	Extended Price	$455.79	Exp. Org.	
3C	GR	Mech	Class 6000 ASME B16.11 socket weld 45 degree elbow, 2 ½''	Quantity	1	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$858.63	Exp. Type	
			UN Number Hazard Class	Extended Price	$858.63	Exp. Org.	

Line #	Line Type	PO Line Category	Description (Start with a Noun) (240 Characters Maximum, Enter Additional Description in Cell Below Line Item)	Quantity, Unit of Measure and Price			
4C	GR	Mech	Class 6000 ASME B16.11 socket weld 90 degree elbow, 2 ½''	Quantity	2	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$348.82	Exp. Type	
			UN Number Hazard Class	Extended Price	$697.64	Exp. Org.	
5	GR	Mech	Class 6000 ASME B16.11 socket weld tee, ¾''	Quantity	6	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$58.46	Exp. Type	
			UN Number Hazard Class	Extended Price	$350.76	Exp. Org.	
6	GR	Mech	Class 6000 ASME B16.11 socket weld 90 degree elbow, ¾''	Quantity	20	Project	
				Unit of Measure	Each	Task	
				Price per Unit	$37.37	Exp. Type	
			UN Number Hazard Class	Extended Price	$747.40	Exp. Org.	

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Type and Expenditure Organization

Quantities applied to each Project/Task/Expenditure

Fermilab

PURCHASE REQUISITION

Requisition

Requisition Number (Filled in by System)	Oracle Preparer (Filled in by System)	Date	Request originator:
		4-2-11	Mike Zuckerbrot
Division/Section Approval		Date	NEPA Approval
Business Office Approval		Date	
Directorate Approval		Date	

Requisition Header

Description (of entire requisition)
Hydraulic components for the Ash River block pivoter

Note to Approver

Justification (To Approver)

Requisition Entry Defaults

Requester	Deliver-To-Location	Buyer Note (use attachments)
Mike Zuckerbrot	(not Mail Station) **Lab F**	(i.e., Previous PO)

Suggested Vendor	Suggested Vendor Site	Suggested Vendor Contact
Columbia Pipe / best source	544 South Lake Street Aurora, Illinois 60506	

Reference #	Need-By-Date	Project/Task/Expenditure Type and Expenditure Organization
		425.2.8.1.4 NOvA Ash River Pivoter

Note to Receiver

Requisition Lines

Line #	Line Type	PO Line Category	Description (Start with a Noun) (240 Characters Maximum, Enter Additional Description in Cell Below Line Item)	Quantity, Unit of Measure and Price			
1	GR	Mech	Pipe, ¾'' nominal; ASTM A106 seamless sch. 160, 20 foot random UN Number Hazard Class	Quantity	7	Project	
				Unit of Measure	Per foot	Task	
				Price per Unit	$16.89	Exp. Type	
				Extended Price	$2364.60	Exp. Org.	
2C	GR	Mech	Pipe, 2'' nominal; ASTM A106 seamless sch. 160, 20 foot random UN Number Hazard Class	Quantity	2	Project	
				Unit of Measure	Per foot	Task	
				Price per Unit	$37.71	Exp. Type	
				Extended Price	$754.20	Exp. Org.	
3C	GR	Mech	Pipe, 2 ½'' nominal; ASTM A106 seamless sch. 160, 20 foot random UN Number Hazard Class	Quantity	1	Project	
				Unit of Measure	Per foot	Task	
				Price per Unit	$50.51	Exp. Type	
				Extended Price	$1010.20	Exp. Org.	

Line #	Line Type	PO Line Category	Description (Start with a Noun) (240 Characters Maximum, Enter Additional Description in Cell Below Line Item)	Quantity, Unit of Measure and Price			
4	GR	Mech	UN Number Hazard Class	Quantity		Project	
				Unit of Measure		Task	
				Price per Unit		Exp. Type	
				Extended Price		Exp. Org.	
5	GR	Mech	UN Number Hazard Class	Quantity		Project	
				Unit of Measure		Task	
				Price per Unit		Exp. Type	
				Extended Price		Exp. Org.	
6	GR	Mech	UN Number Hazard Class	Quantity		Project	
				Unit of Measure		Task	
				Price per Unit		Exp. Type	
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Project/Task and Exp.Type where line items are charged and Exp. Org. - organization spending the money, if different from above

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Type and Expenditure Organization

Quantities applied to each Project/Task/Expenditure